MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

TPL 2141 – PROGRAMMING LANGUAGE CONCEPT

(All sections / Groups)

15 OCTOBER 2019
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages (excluding cover page) with 5 Questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided

Question 1

(a) Java, JavaScript and C# are among the most popular programming languages in the recent years.

(i) Describe the implementation method for these languages with the aid of diagram.

(ii) Explain why Java language is influenced by von Neumann computer architecture.

(iii) Why the execution time for C# is always claimed to be faster than JavaScript? Explain.

[3 + 1 + 1 = 5 marks]

(b) Assume that you are a final year student and plan to decide a suitable programming language for your Final Year Project.

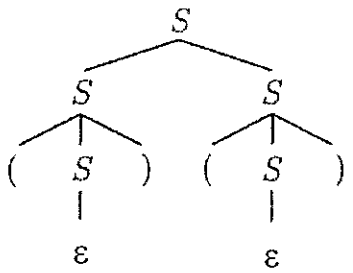
(i) Describe TWO (2) benefits of understanding the concepts of multiple programming languages that can help you to make the decision.

(ii) Integrated programming environment and pre-processor are some of the best tools for a new programmer. Why? Give an example of integrated programming environment and pre-processor.

[2 + 3 = 5 marks]

Question 2

Consider the following parse tree:



(a) List out all the non-terminals and terminals from the above parse tree.

[2 marks]

(b) Construct the context-free grammar defined by the above parse tree.

[3 marks]

(c) Show the rightmost derivation steps for the above parse tree.

[2.5 marks]

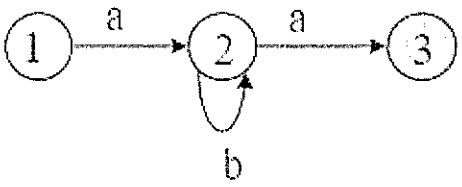
(d) Why this grammar generates two distinct parse trees for this sentence/string: (( )) ( ) . Explain and draw both parse trees.

[2.5 marks]

Continued .....

Question 3

(a) Given the following state transition diagram to recognise an input string.



(i) Describe in English, the input string recognised by the state transition diagram.

(ii) Explain why state transition diagram is useful for lexical analyser?

(iii) Write the context-free grammar from the state transition diagram.

[1 + 1 + 2 = 4 marks]

(b) Parsing is the process of transforming a linear sequence of characters into a syntax tree. Describe THREE (3) differences between top-down and bottom-up parsing.

[3 marks]

(c) Provide the operational semantics for the following C++ loop.

[3 marks]

```
for (i=1; i<=n; i++)
{
     factorial *= i;
}
cout<< "Factorial of "<<n<<" = "<<factorial;
```

Continued .....

Question 4

(a) The following shift-reduce parser failed to accept the input string from the given grammar because of using the **wrong selection of rules** during the handle pruning. However, the sentence is verified to be accepted by the above grammar.

Stack	Input	Action
$	y * y $	Shift
$ y	* y $	Reduce by F → y
$ F	* y $	Reduce by T → F
$ T	* y $	Reduce by E → T
$ E	* y $	Shift
$ E *	y $	Shift
$ E * y	$	Reduce by F → y
$ E * F	$	Reduce by T → F
$ E * T	$	Reduce by E → T
$ E * E	$	**Error**

```
E → E + T | T
T → T * F | F
F →(E) | y
```

[3 marks]

Show a **new shift-reduce parser** and use the reverse of a rightmost derivation to find the correct selection of rules during the handle pruning.

(b) Logical operators are similar to relational operators in that they both produce Boolean results.

Logical Operators			Relational Operators					
&&	||	!	>	>=	<	<=	==	!=

(i) How are these operators being used in an expression? What output is expected from the expression? Explain with an example of expression for the logical and relational operators. [2 marks]

(ii) Short-circuit evaluation is used to implement logical operators in an expression to reduce the evaluation steps. Consider the following **Java** code snippet, compare the steps for **with and without** short-circuit evaluation.

```
int a = 3;
int b = 4;
int c = 5;
int d = 6;
boolean result = (a == b) && (c < d);
System.out.println(result);
```

[4 marks]

(iii)Other than Java, provide TWO (2) programming languages that also implement short-circuit evaluation. [1 mark]

Continued .....

Question 5

(a) Given the following code snippet for **C++** language.

```
int x = 1,  y = 0;

int g (int z)
{   return x + z;   }

int f (int y) {
    int x;
    x = y + 1;
    return g(y*x);
}
y = f(3);
```

Discuss the process of finding the value of **x** based on the following:
(i) static scoping
(ii) dynamic scoping

[2 + 2 = 4 marks]

(b) Given the following pseudocode with the internal operations of passed-by-value.

[4 marks]

Internal Operations:

	k	n
1	5	5
2	8	5
3	--	5
4	--	5

```
procedure p(k:integer)// 1
   begin
      k := k+3 // 2
   end

integer n := 5 // 3
p(n)
print(n)  // 4
```

Explain TWO (2) differences between the passed-by-reference and passed-by-value-result by using the internal operations table.

(c) Given the following control structures in **Python** language using `if`, `for` and `continue`. Explain the operation steps of the control structures in the program.

[2 marks]

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
  if x == "banana":
    continue
  print(x)
```

End of Paper